AASHTO/AWS D1.5M/D1.5:2015
An American National Standard

Bridge Welding Code

A Joint Publication of

American Association of State Highway and Transportation Officials

AASHTO

AWS American Welding Society®

Approved American National Standard

ANSI

AASHTO/AWS D1.5M/D1.5:2015
An American National Standard

Approved by the
American National Standards Institute
November 3, 2015

Bridge Welding Code

7th Edition

Supersedes AASHTO/AWS D1.5M/D1.5:2010

Prepared by the
American Welding Society (AWS) D1 Committee on Structural Welding
AASHTO Highway Subcommittee on Bridges and Structures

Under the Direction of the
AWS Technical Activities Committee
AASHTO Executive Committee

Approved by the
AWS Board of Directors
AASHTO Board of Directors/Policy Committee

Abstract

This code covers the welding requirements for AASHTO welded highway bridges made from carbon and low-alloy constructional steels. This 2015 edition contains dimensions in metric SI Units and U.S. Customary Units. Clauses 1 through 7 constitute a body of rules for the regulation of welding in steel construction. The provisions for Clause 9 have been distributed throughout the D1.5 code. Clauses 8, 10, and 11 do not contain provisions, as their analogue D1.1 sections are not applicable to the D1.5 code. Clause 12 contains the requirements for fabricating fracture critical members.

A Joint Publication of:

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Highway and Transportation Officials
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Foreword

This foreword is not part of AASHTO/AWS D1.5M/D1.5:2015,
Bridge Welding Code, but is included for informational purposes only.

The original preparation of this specification was undertaken in response to a need for a common welding specification for the fabrication of steel highway bridges across the country. Prior to its publication, the departments of highways and transportation that make up the American Association of State Highway and Transportation Officials (AASHTO) had routinely used other specifications of the American Welding Society (AWS) Structural Welding Committee, with various unique modifications, to produce contract documents suitable for the construction of bridges. The proliferation of disparate requirements resulted in the need for a single specification that could facilitate uniformity and improved economy in steel bridge fabrication, while at the same time addressing the issues of structural integrity and public safety.

The first AWS code for *Fusion Welding and Gas Cutting in Building Construction* was published in 1928. In 1934, a committee was appointed to prepare specifications for the design, construction, alteration, and repair of highway and railway bridges. The first bridge specification was published in 1936. Until 1963, there were separate AWS committees for bridges and buildings. These two committees joined in 1963 to form the Structural Welding Committee of the American Welding Society. The committee has since promulgated standards for the application of welding to the design and construction of structures.

The Federal Highway Administration of the United States Department of Transportation requires states using federal funds for the construction of welded highway bridges to conform to specified standards for design and construction. Conformance to the AWS *Specification for Welded Highway and Railway Bridges* was first specified in the third edition of the AASHTO *Standard Specifications for Highway Bridges* in 1941. In 1962, the Bureau of Public Roads, now the Federal Highway Administration (FHWA), required conformance to a Circular Memorandum, dated November 13, 1962, which transmitted additional provisions for welding A36 steel pending publication of an AWS specification which would contain certain essential provisions not then in the code. Another Circular Memorandum, dated February 11, 1965, specified requirements for CVN testing, and a further Circular Memorandum, dated August 19, 1966, modified provisions of the 1966 Edition of the AWS D2.0-66, *Specification for Welded Highway and Railway Bridges*.

In 1974, AASHTO published the first edition of the *Standard Specification for Welding of Structural Steel Highway Bridges.* The Eleventh Edition of the AASHTO *Standard Specifications for Highway Bridges*, dated 1977, directed "Welding shall conform to the requirements of the AASHTO *Standard Specifications for Welding of Structural Steel Highway Bridges* 1974 and subsequent interim specifications…" AASHTO published the Second and Third editions of the *Standard Specifications for Welding of Structural Steel Highway Bridges* in 1977 and 1981. All of the AASHTO specifications were required to be part of the Contract Documents as modifications or additions to the AWS *Structural Welding Code—Steel.* This was a cumbersome procedure.

In 1982, a subcommittee was formed jointly by AASHTO and AWS, with equal representation from both organizations, to seek accommodation between the separate and distinct requirements of bridge owners and existing provisions of AWS D1.1. The *Bridge Welding Code* is the result of an agreement between AASHTO and AWS to produce a joint AASHTO/AWS *Bridge Welding Code* for steel bridges that addresses essential AASHTO needs and makes AASHTO revisions mandatory.

The first edition of the *Bridge Welding Code*, published in 1988, provided for the qualification of welding procedures by test to assure that welds have the strength, ductility, and toughness necessary for use in redundant structures. Nonredundant fracture critical bridge members were not provided for in the first edition of the code. While qualification of welding procedures is required, a major effort has been made to specify the minimum number of tests and the simplest tests

that give reasonable assurance of required mechanical properties. Efforts are made to discourage individual States from requiring duplication of weld testing unless that testing is specified in the bid documents. Special attention is directed to avoidance of unnecessary hardening of base metal HAZs and the avoidance of hydrogen and other items that can lead to weld or base-metal cracking.

Consequently, while the D1.5-88 document has a superficial resemblance to D1.1 in its general format, there are significant differences that users should be aware of, among them the lack of provisions relating to statically loaded structures, tubular construction or the modification of existing structures. Users are encouraged to develop their own requirements for these applications or use existing documents (e.g., D1.1) with the appropriate modifications.

Changes in Code Requirements. Underlined text in the clauses, subclauses, tables, figures, or forms indicates a change from the 2010 edition. A vertical line in the margin of a table or figure also indicates a change from the 2010 edition.

The publication of AASHTO/AWS D1.5M/D1.5:2015 was justified by the need to monitor, revise, and update code provisions based on the needs of AASHTO member states and industry. The following is a list of the most significant revisions in the 2015 edition:

Summary of Changes

Clause/Table/ Figure/Annex	Modification
2.11.3	Created to include groove welds in corner and T-joints. As such, this requirement was deleted from the notes for Figures 2.4 and 2.5; it was note f in the 2010 edition.
3.5.6.1	Modified to clarify how variation from flatness is measured.
3.5.1.7	Revised to include directions on how to measure combined warpage and tilt of flange.
3.6	Reorganized for clarification and now includes new subclauses on fillet welds, groove welds, removal of weld reinforcement, and surface finish.
3.6.2	Revised to clarify weld reinforcement and associated ground flush requirements.
Figure 3.3	Created to show flange offset for tube girders.
4.1.3	Revised consumable requirements to establish two approaches - manufacturer quality assurance and heat or lot testing.
4.1.4	Revised and reorganized for the clarification of consumable certifications.
4.2.7	Expanded with two new subclauses on the extent of preheat and interpass.
4.10 and 4.11	Consolidated into new subclause 4.10.
Table 4.1	Test requirements were extracted and placed as new Table 5.1.
Clause 5	Revised the heat input qualification by broadening voltage limits and adding a new amperage limit table; for the production qualification method, removed prequalification-based restrictions in lieu of variable qualified by test; and removed the groove weld requirement for qualification of single-pass fillet weld procedures.
5.3	Removed expiry limits for nonfracture critical PQRs.
Table 5.1	Content extracted from Table 4.1 in the 2010 edition.
Table 5.4	Modified to include qualification requirements with Figure 5.8 with the exception of EGW.
Table 5.10	Created to indicate the amperage limits for heat input welding procedure qualification.
Figure 5.8	Modified to include dihedral angle.

Summary of Changes (Continued)

Clause/Table/ Figure/Annex	Modification
6.7.6.2	Revised to include pulsed DC.
6.7.8	Created to introduce phased array ultrasonic testing.
12.6.1	(Heat or Lot Testing) was deleted.
12.7.4	Revised to indicate no limits to the period of effectiveness for fillet weld soundness test and increase the period of effectiveness for PQRs from 36 months to 60 months.
Annex K	New annex that addresses phased array ultrasonic testing.
C-12.6.1.1	Deleted.
C-12.7.3	Deleted.
C-Annex K	New commentary added for Annex K.
Global	“Chemistry” replaced with “Chemical composition.”
Global	“Grade 100" replaced with “HPS 100W.”

Commentary. The Commentary is nonmandatory and is intended only to provide insightful information into provision rationale.

Normative Annexes. These annexes address specific subjects in the code and their requirements are mandatory requirements that supplement the code provisions.

Informative Annexes. These annexes are not code requirements but are provided to clarify code provisions by showing examples, providing information, or suggesting alternative good practices.

Index. As in previous codes, the entries in the Index are referred to by subclause number rather than by page number. This should enable the user of the Index to locate a particular item of interest in minimum time.

Errata. It is the Structural Welding Committee’s Policy that all errata should be made available to users of the code. Therefore, any significant errata will be published in the Society News Section of the *Welding Journal* and posted on the AWS web site at: http://www.aws.org/technical/d1/.

Suggestions. Your comments for improving AWS D1.5M/D1.5:2015, *Bridge Welding Code* are welcome. Submit comments to the Managing Director, Technical Services Division, American Welding Society, 8669 NW 36 St, # 130, Miami, FL 33166; telephone (305) 443-9353; fax (305) 443-5951; e-mail info@aws.org; or via the AWS web site <http://www.aws.org>.

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